Ka-Band Utilization and Technology Study

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Semi-Annual Review of the FY97 SOMO/MO&DSD Technology Development Program

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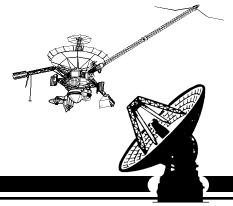
Ka-Band Utilization and Technology Study

Objective and Significance



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Overall Objective

Study Ka-band utilization and implementation issues for LEO spacecraft to ensure a coordinated evolution to TDRS H,I,J or direct downlink services

Goals	Significance
#1: Define the range of users and user needs under consideration	• Current SN users can benefit from Ka-band links t transmit higher data rates with the increased bandwidth available and can implement smaller antenna on the spacecraft than those required for band or S-band.
#2: Establish architectural and operations concept options	• New approaches to operation and command/ scie data transport are possible by the higher performance Ka-band service. • Potential for increased science data throughput a greater user flexibility.
#3: Perform trade studies - Performance and operational trades - Identification of available technology - Frequency allocation and selection issues - Identification of risk areas	• Validates operations concepts to ensure efficient of SN and GN resources. • Ensures needed technologies are available for fu flight projects • Supports the definition of needed technology demonstrations
#4: Define the best strategies for evolution to Ka-band service	• By developing a coordinated strategy for introduc of Ka-band capabilities to the user community, thi effort will minimize the proliferation of user-uniqu solutions that require redesign and repurchase fo each new mission. • Defines plans for future Ka-band technology development efforts with emphasis on phased arr antenna development

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Architecture/Operations Concept Development

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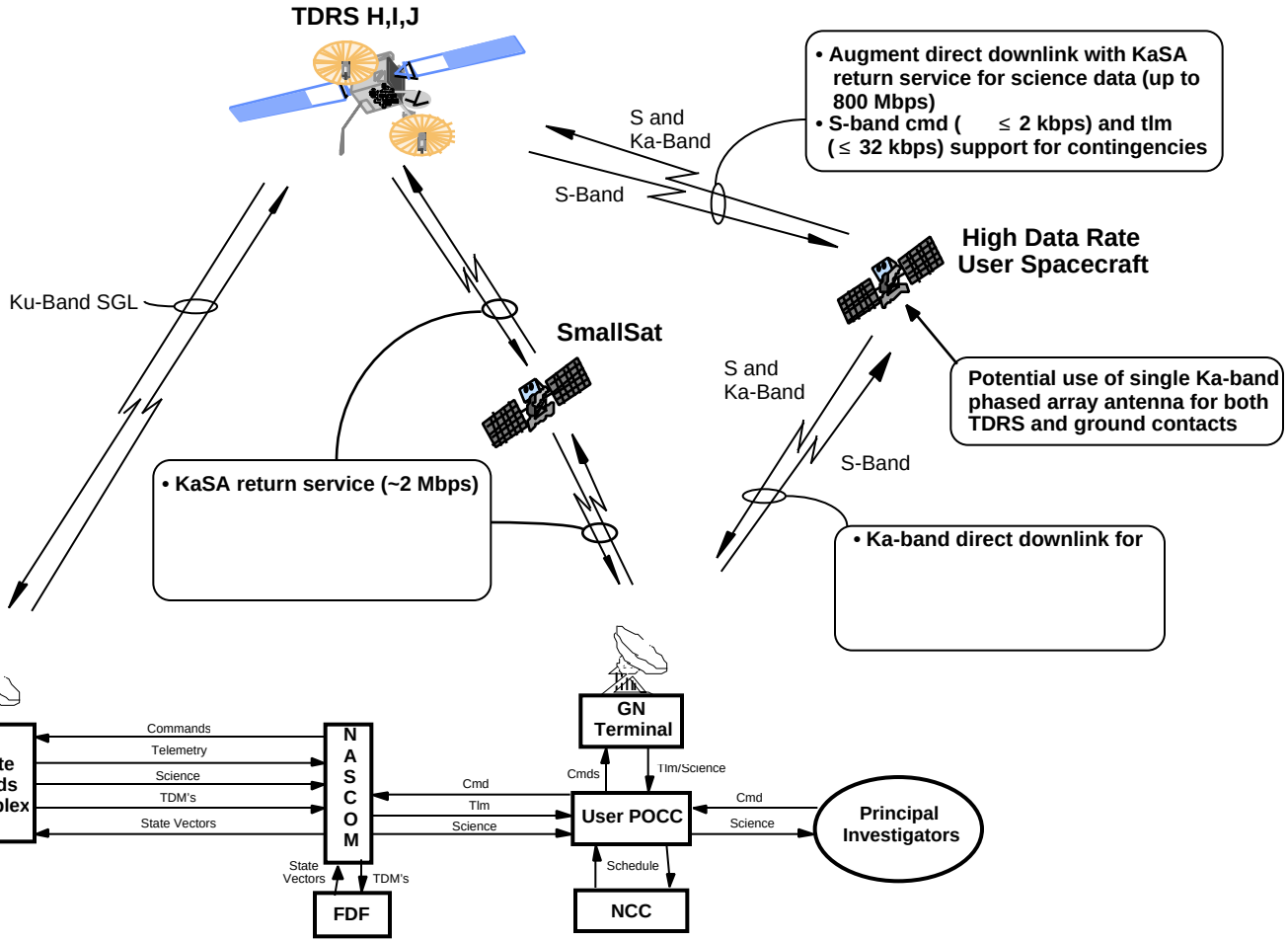
- **SN/GN operations concept developed to give users the option of communicating via TDRS H,I,J or directly to a high latitude ground station.**



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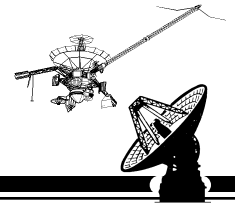
Key Trade Studies (Goal #3) (Cont'd)



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- **"Off-the-shelf" Ka-band ground station and space qualified components are available as a result of a number of Government and industry efforts:**
  - **NASA ACTS and TDRS H,I,J programs.**
  - **NASDA's COMETS and ETS-VI programs.**
  - **ESA's OLYMPUS program.**
  - **Iridium's feeder link ground stations.**
- **Components typically designed for 20/30 GHz operations and would require some modifications for 25.25 - 27.5 GHz operation.**
- **Ground components include antennas LNAs, power amplifiers and high data rate receivers.**
- **Space qualified components include dish antennas, LNAs, modems, RF switches, and power amplifiers.**
- **Due to rapid pace of current commercial development, within 3 years there will be an abundance of Ka-band equipment, space qualified and flying**
- **Most companies currently developing Ka-band equipment are not interested in selling it or publishing specifications.**

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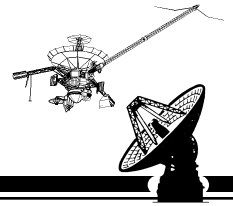
Strategies for Evolution to Ka-Band Service



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- **Goal of evolution strategy is to minimize impact to users when transitioning to Ka-band.**
- **Ka-band evolution strategies include:**
  - **Plan and implement a Ka-band ground terminal that supports direct downlink and TDRS H,I,J testing.**
  - **Implement a Ka-band capability for the 4th Generation User Transponder.**
  - **Develop Ka-band phased array antenna for flight demonstration.**
  - **Perform flight demonstrations of transponder and phased array on future LEO missions to validate "dual-use" concept (direct-to-ground and TDRS H,I,J).**
  - **Develop an internal Web site to promote interactive exchange of Ka-band technology information.**

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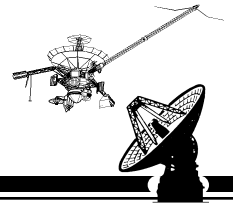
FY97 Accomplishments



- **Surveyed industry on current trends in ground terminal design and implementation.**
- **Defined users and user needs.**
- **Developed three candidate Ka-band ground terminal architecture/operations concept (Goal #2).**
- **Updated survey of available Ka-band technology.**
- **Submitted an abstract to the 3rd annual Ka-band Utilization Conference.**

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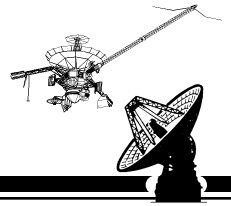
Schedule



Task	FY96				FY97			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
FY 97 Goals • **Refine ops concept & evolution plans** • **Update Ka-band technology database** • **Perform ground terminal architecture design** • **Develop an Internet Web site for Ka-band info exchange**								